

## REMARKS

Claims 1-10 and 18-59 are pending.

### Restriction/Election Requirement (Office Action Paragraphs 1-11)

In response to the 10-way restriction requirement, applicants hereby elect with traverse Group IX, presently including claims 7, 18, 19, 46, 49, 53-54 and 58-59. Applicants respectfully traverse the restriction requirement on the basis that the Examiner has not established that examining all of the claim limitations in the application would not constitute a serious burden, especially since many of the groups are indicated to belong to the same subclass.

In addition, Applicants respectfully submit that Group X (claims 21-27, 47 and 55) be rejoined with Group IX. Since Group X has been amended to recite "a supported cross-linked chiral compound" or "a cross-linked chiral compound" to, in part, clarify their rejoinder to Group IX. Second, claims 21-27, 47 and 55 of Group X depend directly or indirectly from the claims of Group IX. Once the claims of Group IX are deemed patentable, so should the claims of Group X. Consequently, it is respectfully submitted that the claims of Group X should be rejoined to the claims IX.

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### Election of Species Requirement (Office Action Paragraphs 12-19)

Applicants hereby elect the species depicted on the attached page. The elected species results from the synthesis disclosed in the successive steps of Examples 2b), 3a), 3b2), and 4a). At least the following claims are readable upon the elected species are: 18, 20, 21, 25, 27, 49, and 53.

### Claim Rejections - 35 U.S.C. §112, 1st paragraph (Office Action Paragraphs 20-21)

Claims 7, 18-20, 45-46, 49, 53-54, and 58-59 stand rejected as allegedly containing subject matter not described in the specification. The Action alleges that the specification provides no teaching of how to make polymerized and cross-linked polymers of the instant claims. Specifically, the Action alleges that there is no teaching of how to make polymers of general formula (I) wherein (i) the chiral units are linked directly to one another, and (ii) multiple units of "LINK A" are connected through peroxy linkages, i.e. q, q1, q2, or n greater than 1. Applicants respectfully traverse these rejections.

First, the specification discloses the invention provides a cross-linked compound at pages 12-18. What is more, the specification provides several examples at pages 22-34. Particularly, the elected species was derived by performing successive steps 2b, 3a, 3b2, and 4a. Accordingly, the specification teaches how to make polymers of general formula (I) wherein (i) the chiral units are linked directly to one another, and (ii) multiple units of "LINK A" are connected through peroxy linkages, i.e. q, q1, q2, or n greater than 1.

In greater detail, in the preparation of Example 2b, 1 mole of 4-allyloxyphenylisocyanate is reacted with 2 moles of cellulose where each cellulose moiety has two heterocyclic rings. Thus, two substituents 4-allyloxyphenylurethane attach to four cellulose moieties on the 6-position. For four cellulose moieties, the amount of 3,5-dimethylphenylisocyanate allows the attachment of 10 substituents of 3,5-dimethylphenylurethane on the two remaining 6 positions and on the four 2-positions and the four 3-positions.

In Example 3b2, one of the two 4-allyloxyphenylurethane substituents react with the mercaptopropylmethoxy silylated silica support. Thus, there remains one 4-allyloxyphenylmethane substituent per 4 cellulose units to be involved in crosslinking with a 4-allyloxyphenylurethane substituent of another set of 4 cellulose units.

Each of the various free allyl groups added (by means of the benzoyl peroxide in Example 4a) to another allyl group from a hexanediyl linkage. In the formula of LINK A, L can be a single bond.

Thus, there is in the cross-linked chiral compound with as many links between chiral units as there are pairs of free ethyleneic (allylic) radicals that can be linked with each other. As exemplified, at least some of the chiral units are linked directly to one another.

Consequently, Applicants respectfully submit that the rejections should be withdrawn.

**Claim Rejections - 35 U.S.C. §112, 2nd paragraph (Office Action Paragraphs 22-28)**

Claims 7, 18-20, 45-46, 49, 53-54, and 58-59 stand rejected as allegedly being indefinite, as indicated in the Action at paragraphs 24a-l, and 25-28.

The claims have been amended to obviate the grounds at paragraphs 24c, 24d, 24f, 24i, 24l, 26, and 28; at least a portion of the grounds at paragraphs 24b, 24g, and 24h; and the ground at the first sentence of paragraph 27. With respect to the remaining grounds, Applicants respectfully traverse and will address each as follows.

At paragraph 24a, the Action alleges that the recited process steps do not lead to the structure of "general formula (I)". Applicants respectfully traverse this assertion because the exemplified species has the structure of "general formula (I)" and is read upon by claim 18. As such, Applicants respectfully submit that this rejection be withdrawn.

At paragraph 24b, the Action alleges that the structures of "general formula (I)" are not cross-linked. Applicants respectfully traverse this assertion because the chiral units are cross-linked by the link A. As such, Applicants respectfully submit that this rejection be withdrawn.

At paragraph 24e, last sentence of paragraph 24g, last sentence of paragraph 24h, the Action alleges that R cannot be hydroxyl or another active group that can react with Q. At the outset, in the absence of a scientific reason, Applicants respectfully submit that these assertions are not proper under 35 U.S.C. 112, second paragraph. The Office has failed to provide any evidence or reference why these terms are indefinite.

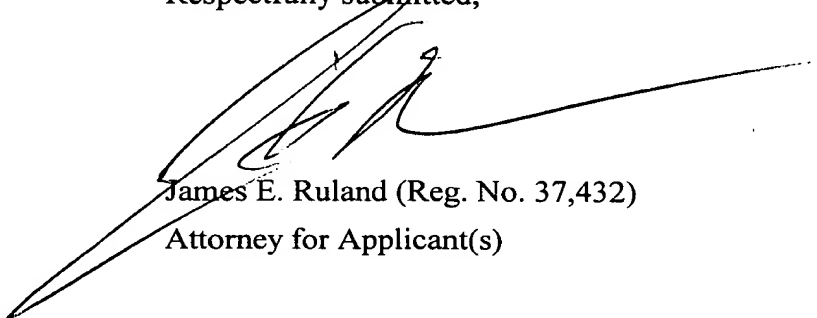
At paragraph 24j, the Action alleges that the "chiral unit" may be a unit derived from a chiral compound but it is no longer a chiral compound. Applicants respectfully submit that they are their own lexicographers. They can define their invention essentially in whatever terms they choose so long as the terms are not used in ways that are contrary to accepted meanings in the art. (M.P.E.P. 2173.01). As such, the rejection is apparently based on speculation and is not readily understandable.

At paragraph 24k, the Action alleges that Ar, R and X in the links of the general formula are different than in the initial "bifunctional compound", which is not seen to be possible. Applicants respectfully submit that the Link A can result from the reaction of two bifunctional compounds which have already reacted with a hydrogen atom of a product, as discussed above. As such, Applicants respectfully submit that Ar, R and X have not changed in Link A, but simply Link A depicts the joinder of two bifunctional compounds. There is nothing impossible when the claim is read as a whole.

At paragraph 25, the Action alleges that claim 20 is indefinite because it is unclear as to what the extra bonds on the chiral units are attached, as in the case of the first three formulas exceeds the number of linking bonds in the parent claim. Applicants respectfully traverse. As depicted in the formula at claim 18 and the elected species, it is clear that these extra bonds can be joined to Link B or to another chiral unit. As such, Applicants respectfully submit that these rejections be withdrawn.

In view of the above remarks, favorable reconsideration is courteously requested. Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached page is captioned, "**VERSION WITH MARKINGS TO SHOW CHANGES MADE**". If there are any remaining issues which can be expedited by a telephone conference, the Examiner is courteously invited to telephone Counsel at the number indicated below.

Respectfully submitted,



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JER\AK\PET\1638 D1\AMENDMENT AND RESPONSE.DOC

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE TITLE

*Please replace the title with the following rewritten title:*

~~POLYMERIZED AND~~ CROSS-LINKED CHIRAL COMPOUNDS AND METHODS OF MAKING THEREOF

IN THE CLAIMS:

*Please amend the claims as follows:*

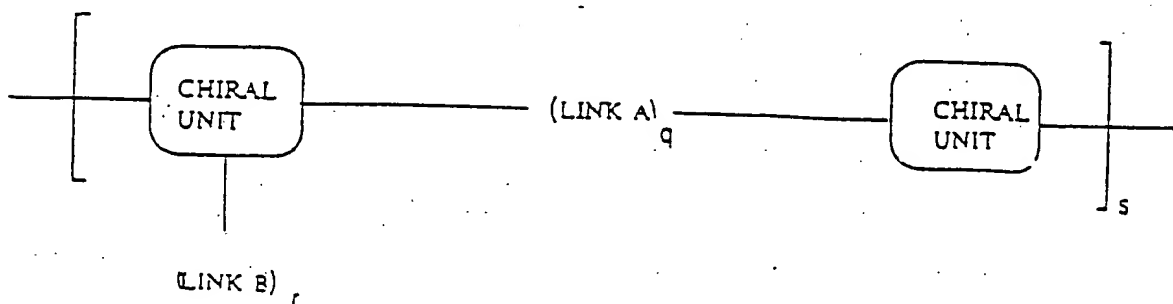
7. (Thrice Amended) A ~~polymerised and~~ crosslinked chiral compound according to claim 18, in which the chiral compound is polymerised by cross-linking at least a portion of the alkenyl moieties to obtain polymer beads which essentially constitute a chiral support.

18. (Thrice Amended) A ~~polymerised and~~ cross-linked chiral compound obtained by reaction of at least one hydrogen of an alcohol, amine or thiol function of at least one chiral unit of a product with at least one group Q of a ~~bifunctional~~ an alkenyloxyaryl or alkenylaryloxyaryl ~~type~~ compound with general formula  $[R-CH=CH-(X)-O]_n-Ar-Q$ ,

where Q is a group which is reactive towards a hydrogen carried by a heteroatom selected from the group formed by oxygen, nitrogen and sulphur, or a precursor of such a group and where:

- n is in the range 1 to 20;
- R is hydrogen or a linear or branched alkyl group or a linear or branched alkoxy group or hydroxyl or an aryl group, ~~which may be~~ optionally substituted;
- X is ~~an optional~~ a linear alkyl alkylene group carrying more than one carbon atom or a branched ~~alkyl~~ alkylene group, or an ~~aryl~~ arylene group, ~~which may be~~ optionally substituted with at least one group selected from the group formed by ~~hydrogen~~, alkyl, alkoxy, hydroxyl and trihalogenoalkyl groups;
- Ar is an ~~aryl~~ arylene or ~~polyaryl~~ polyarylene group, ~~which may be~~ polyarylene optionally substituted ~~with at least one hydrogen atom or~~ with at least one group selected from the group formed by alkyl, alkoxy, hydroxyl, trihalogenoalkyl, silyl, thiol, amino, ~~amino~~, aminoalkyl, amide, nitro, nitrosamino, N-amino, aldehyde acid or ester groups; excluding the following compounds: 4-allyloxyaniline, 4-allyloxybenzoic acid, its acid chloride, and 4-allyloxyphenylisocyanate, wherein the cross-linked chiral

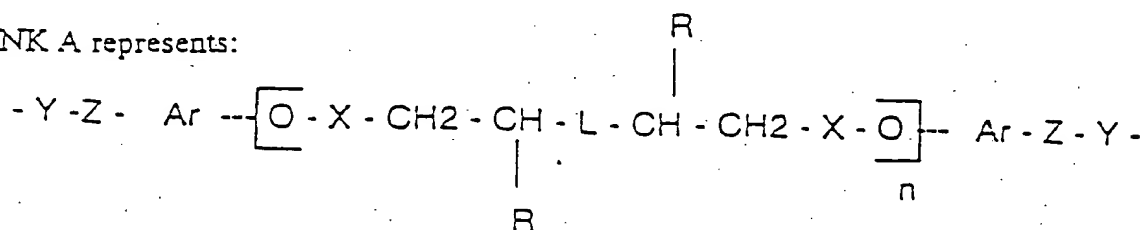
compound or its ester, amide, urea, carbamate, thioester or thiocarbamate derivatives with has the general formula (I):



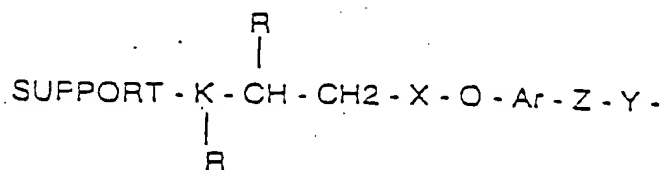
where:

- q is at least 1 and less than 20;
- s is at least 1 and less than 20000;
- if  $r = 0$ , the compound is a pure cross-linked chiral polymer, oligomer or monomer;
- if  $r \geq 1$ , the compound is a chiral polymer, oligomer, or monomer which is cross-linked in a three-dimensional network and bonded to a cross-linked support,

LINK A represents:



LINK B represents:



- "chiral unit" represents a monomeric, oligomeric, cyclooligomeric or polymeric chiral compound and optionally comprises a primary or second amine function or a primary, secondary or tertiary hydroxyl function or a sulphhydryl function and in which all or a portion of these functions have optionally been modified to the ester, amide, urea, carbamate, thioester or thiocarbamate;
- Z represents a  $-\text{CH}_2-$  group or a  $-\text{CO}-$  group or a  $-\text{NH}-\text{CO}-$  group or a  $-\text{NH}-\text{CS}-$  group;
- Y represents a sulphur or oxygen atom or the amino group;

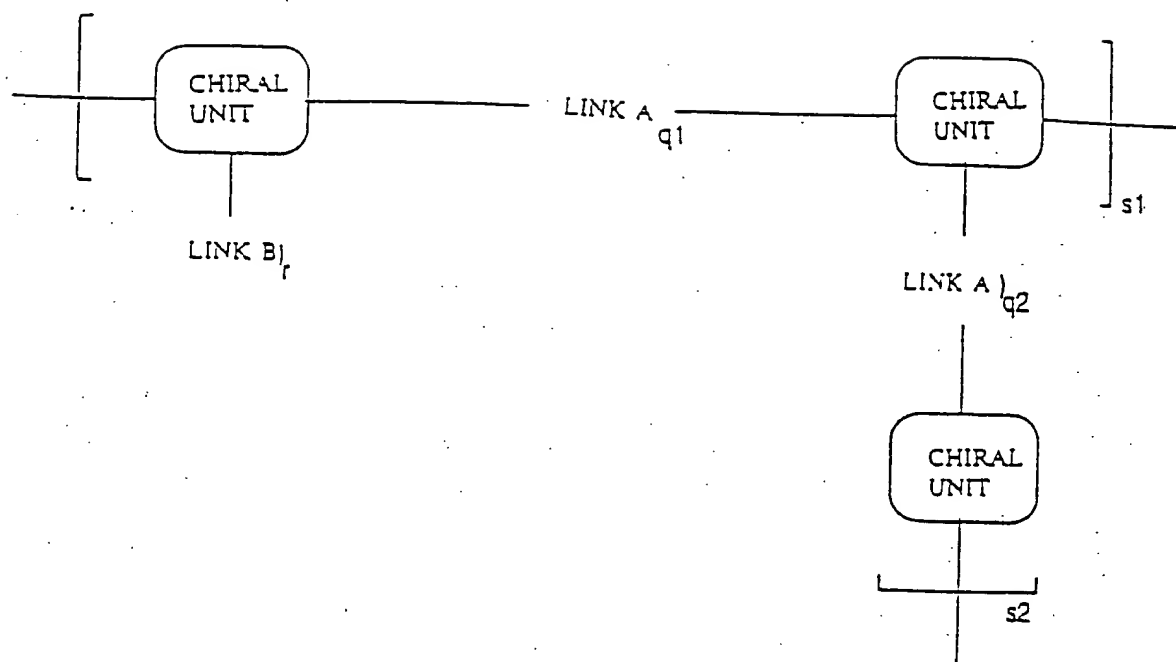
- n is in the range of 1 to 20;
- Ar represents an aryl or polyaryl group;
- X represents an alkyl or aryl group;
- R represents an alkyl group or hydrogen;
- L represents a single bond of a bis-sulphhydryl or a silane or an ethylene group which may be substituted or a disiloxane;
- K represents a single bond or a siloxane or a silane wherein if K is a single bond, R is not present;
- "support" represents an organic or mineral support; functionalised by an alkene or a hydrogenosilane or a sulphhydryl.

19. (Thrice Amended) A ~~polymerised and~~ cross-linked chiral compound obtained by reaction of at least one hydrogen of an alcohol, amine or thiol function of at least one chiral unit of a product with at least one group Q of a ~~bifunctional~~ an alkenyloxyaryl or alkenylaryloxyaryl ~~type~~ compound with general formula  $[R-CH=CH-(X)-O]_n-Ar-Q$ ,

where Q is a group which is reactive towards a hydrogen carried by a heteroatom selected from the group formed by oxygen, nitrogen and sulphur, or a precursor of such a group and where:

- n is in the range 1 to 20;
- R is hydrogen or a linear or branched alkyl group or a linear or branched alkoxy group or hydroxyl or an aryl group, ~~which may be~~ optionally substituted;
- X is ~~an optional~~ a linear alkyl alkylene group carrying more than one carbon atom or a branched ~~alkyl~~ alkylene group, or an ~~aryl~~ arylene group, ~~which may be~~ optionally substituted with at least one group selected from the group formed by ~~hydrogen~~, alkyl, alkoxy, hydroxyl and trihalogenoalkyl groups;
- Ar is an aryl or polyaryl group, ~~which may be~~ optionally substituted with at least one hydrogen atom or with at least one group selected from the group formed by alkyl, alkoxy, hydroxyl, trihalogenoalkyl, silyl, thiol, amino, ~~amine~~, aminoalkyl, amide, nitro, nitrosamino, N-amino, aldehyde acid or ester groups;

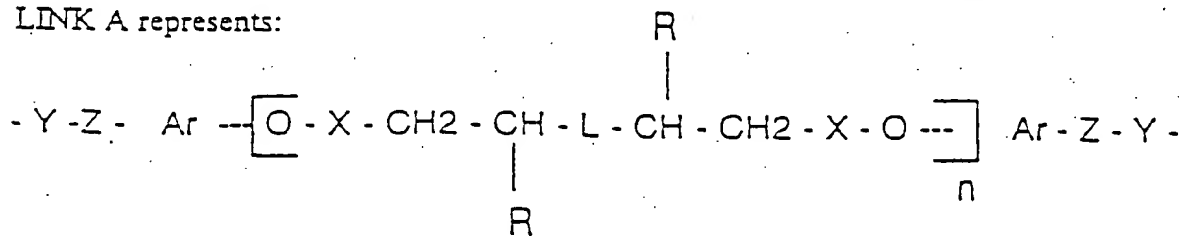
excluding the following compounds: 4-allyloxyaniline, 4-allyloxybenzoic acid, its acid chloride, and 4-allyloxyphenylisocyanate, wherein the cross-linked chiral compound or its ester, amide, urea, carbamate, thioester or thiocarbamate derivatives, with has the general formula:



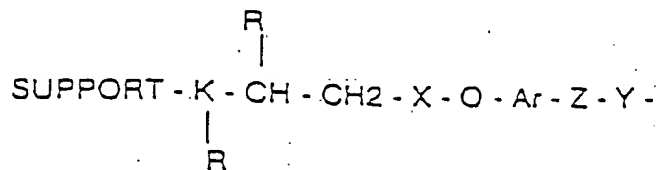
where:

- $q_1$  and  $q_2$  are each at least 1 and less than 20;
- $s_1$  and  $s_2$  are each at least 1 and less than 20000;
- if  $r = 0$ , the compound is a pure cross-linked chiral polymer, oligomer or monomer;
- if  $r \geq 1$ , the compound is a chiral polymer, oligomer or monomer which is cross-linked in a three-dimensional network and bonded to a cross-linked support;

LINK A represents:



LINK B represents:



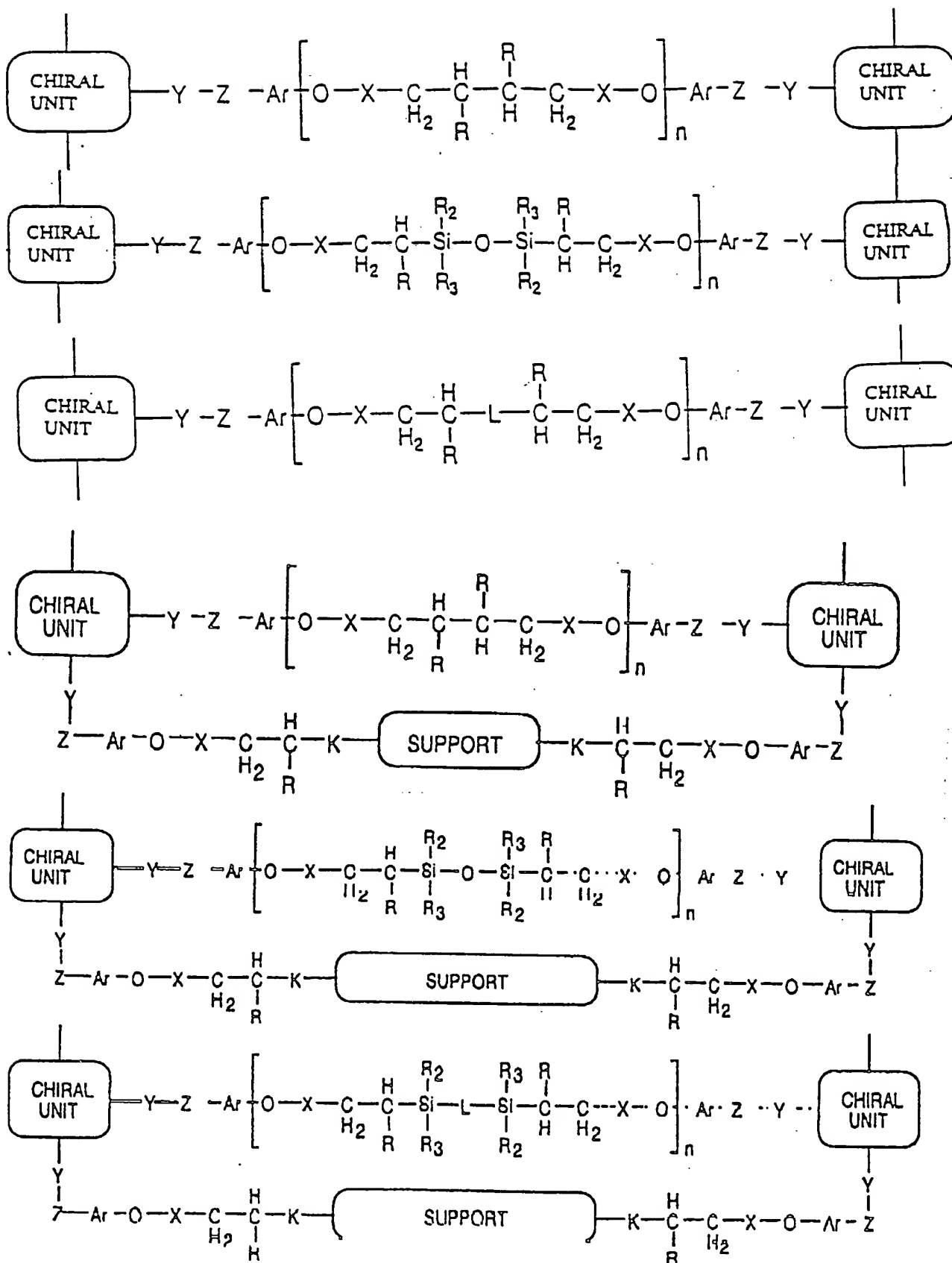
- "chiral unit" represents a monomeric, oligomeric, cyclooligomeric or polymeric chiral compound and optionally comprises a primary or second amine function or a primary, secondary or tertiary hydroxyl function or a sulphhydryl function and in which all or a



portion of these functions have optionally been modified to the ester, amide, urea, carbamate, thioester or thiocarbamate;

- Z represents a -CH<sub>2</sub>- group or a -CO- group or a -NH-CO- group or a -NH-CS- group;
- Y represents a sulphur or oxygen atom or the amino group;
- n is in the range of 1 to 20;
- Ar represents an aryl or polyaryl group;
- X represents an alkyl or aryl group;
- R represents an alkyl group or hydrogen;
- L represents a single bond of a bis-sulphhydryl or a silane or an ethylene group which may be substituted or a disiloxane;
- K represents a single bond or a siloxane or a silane wherein if K is a single bond, R is not present;
- “support” represents an organic or mineral support; functionalised by an alkene or a hydrogenosilane or a sulphhydryl.

20. (Amended) A cross-linked chiral compound according to claim 18, having the following formulae:



21. (Amended) A ~~chiral support~~ supported cross-linked chiral compound obtainable from a chiral compound according to claim ~~13~~ 18, by physical deposition on a support.

22. (Amended) A ~~chiral support~~ supported cross-linked chiral compound obtainable from a chiral compound according to claim ~~13~~ 18 and a support, said support having been reacted with at least one group selected from the group formed by alkoxy, halogeno or aminosilane groups to form a derivative, said group also comprising a function of the type -SH, -SiH or -CH=CH-, by forming covalent chemical bonds using at least part of the alkenyl moieties in said chiral compound.

23. (Amended) A ~~chiral support~~ supported cross-linked chiral compound comprising at least one chiral compound according to claim ~~13~~ 19 and at least one support.

24. (Amended) A ~~chiral support~~ supported cross-linked chiral compound according to claim 23, in which the chiral compound is chemically bonded to said support, using at least one covalent chemical bond.

25. (Amended) A ~~chiral support~~ supported cross-linked chiral compound according to claim 21, in which the support is selected from the group formed by gel type supports of native or modified silica, oxides or zirconia, magnesium, aluminum or titanium, glass beads, carbons or any organic polymer.

26. (Amended) A ~~chiral support~~ supported cross-linked chiral compound obtainable from a chiral compound according to claim ~~13~~ 19 by polymerisation, generally by cross-linking at least a portion of the alkenyl moieties of said chiral compound to obtain polymer beads.

27. (Amended) A ~~chiral support~~ supported cross-linked chiral compound comprising beads of a chiral compound according to claim ~~13~~ 18.

45. (Amended) A chiral compound according to claim 18, wherein the bifunctional compound is ~~parapent-4-enoxybenzoic acid~~ p-(4-pentenyl)oxybenzoic acid.

46. (Amended) A cross-linked chiral compound according to claim 19, wherein the ~~bifunctional~~ compound is ~~parapent-4-enoxybenzoic acid~~ p-(4-pentenyl)benzoic acid.

47. (Amended) A ~~chiral support used~~ supported cross-linked chiral compound according to claim 21, wherein the ~~bifunctional~~ compound is ~~parapent-4-enoxybenzoic acid~~ p-(4-pentenyl)benzoic acid.

49. (Amended) A cross-linked chiral compound according to claim 18, in which group Q is selected from the group formed by one of the following groups: -N=C=O or a precursor thereof; -NH<sub>2</sub> or -CON<sub>3</sub>; -COC1 or its precursor; -COOH; -N=C=S; or -CH<sub>2</sub>Y, where Y is Cl<sub>1</sub> ~~or~~ Br<sub>1</sub> ~~or~~ I<sub>1</sub> ~~or~~ methylsulphonyloxy<sub>1</sub> ~~or~~ para-toluenesulphonyloxy<sub>1</sub> or 3,5-dimethylphenylsulphonyloxy.

53. (Amended) A cross-linked chiral compound according to claim 18, in which said chiral unit of a product is a glycosidic unit of a product selected from holosides, heteroholides, oligosides, cyclooligosides, heterooligosides, polyosides, heteropolyosides, enzymes and proteins.

54. (Amended) A cross-linked chiral compound according to claim 19, in which group Q is selected from the group formed by one of the following groups: -N=C=O or a precursor thereof; -NH<sub>2</sub> or -CON<sub>3</sub>; -COC1 or its precursor; -COOH; -N=C=S; or -CH<sub>2</sub>Y, where Y is Cl<sub>1</sub> ~~or~~ Br<sub>1</sub> ~~or~~ I<sub>1</sub> ~~or~~ methylsulphonyloxy<sub>1</sub> ~~or~~ para-toluenesulphonyloxy or 3,5-dimethylphenylsulphonyloxy.

55. (Amended) A cross-linked chiral compound which can be obtained by hydrosilylation of the chiral compound of claim 19 to transform at least a portion of the alkenyl moieties R-CH=CH- using a silane (R<sub>1</sub>, R<sub>2</sub>, R<sub>3</sub>)Si-H generally in the presence of a metallic complex derived from platinum or rhodium to (R<sub>1</sub>, R<sub>2</sub>, R<sub>3</sub>)-Si-CH(R)-CH<sub>2</sub>- moieties, where:

- R<sub>1</sub> is a hydrogen or a methoxy or ethoxy group or a halogen or an amino or alkylamino group;

- R<sub>2</sub> and R<sub>3</sub>, which may be identical to or different from R<sub>1</sub>, are alkoxy, hydroxyl, trihalogenoalkyl, linear or branched alkyl or aryl groups;
- R is hydrogen or a linear branched alkyl group or a linear or branched alkoxy group or a hydroxyl group or an aryl group ~~which may be~~ optionally substituted.

58. (Amended) A cross-linked chiral compound according to claim 19, in which said chiral unit of a product is a glycosidic unit of a product selected from holosides, heteroholisides, oligosides, cyclooligosides, heterooligosides, polyosides, heteropolyosides, enzymes and proteins.

59. (Amended) A ~~polymerised and~~ crosslinked chiral compound according to claim 19, in which the chiral compound is polymerised by cross-linking a at least a portion of the alkenyl moieties to obtain polymer beads which essentially constitute a chiral support.

